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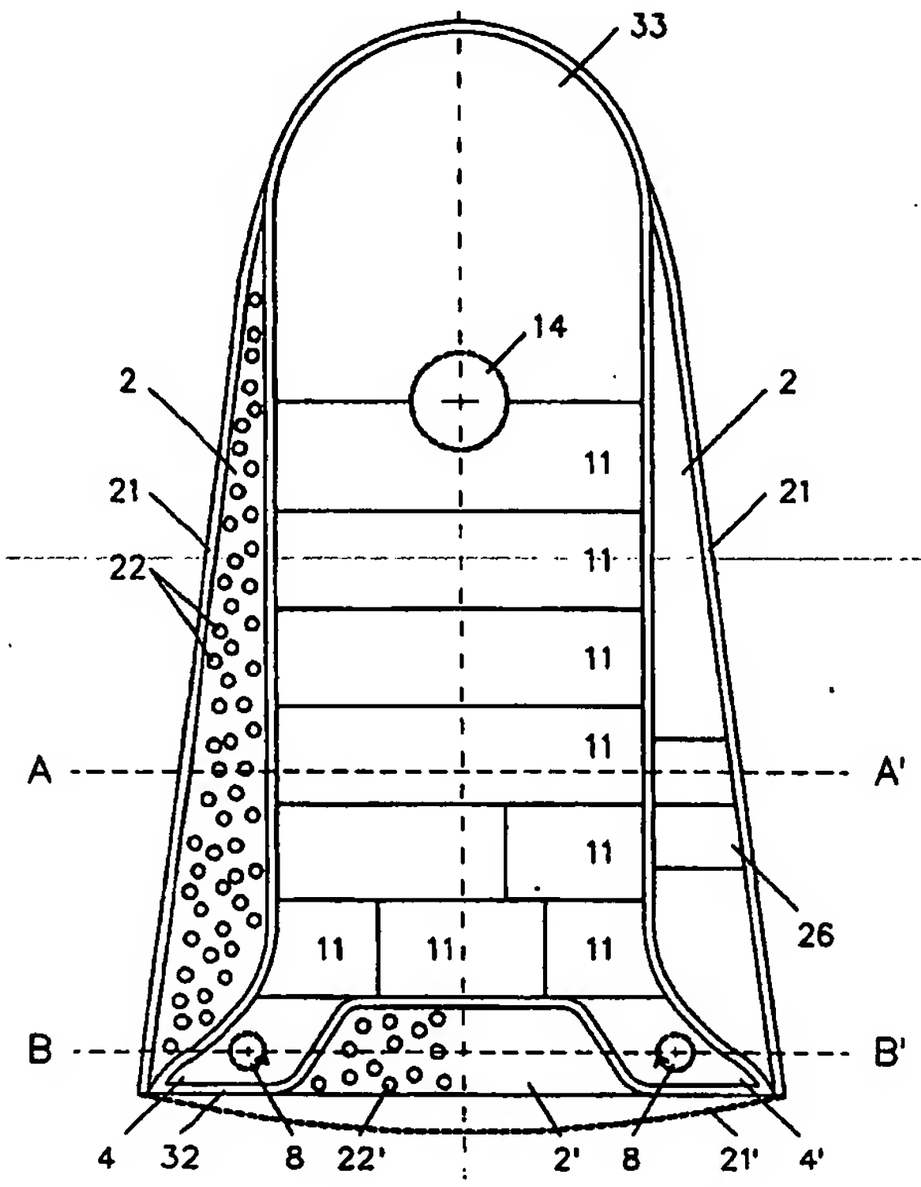
(54) Title: STABILIZED MONOHULL VESSEL

(57) Abstract

Vessel, preferably for petroleum processing and storage, with carrying capacity mainly comprised by one single hull, with a main deck (1). The new and inventive feature is comprised by at least one, mainly horizontally shaped dampening device (1) reaching out from either side of the hull (3) under the water line, extending preferably along the entire length of the vessel. The purpose with, and the effect of the dampening device (2) is to dampen the rolling movements of the vessel, and also for pitch and heave movements. In the preferred embodiment the dampening device (2) has a plurality of vertical apertures (22) allowing limited water through flow. The dampening device (2) with the openings (22) act as a mechanical filter which to a large degree dampens the rolling, pitching and heave movements and let pass long–wave roll, pitch and heave movements, but with dampened amplitude.



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# STABILIZED MONOHULL VESSEL

This application relates to a vessel, preferably for petroleum activities, with carrying capacity generally comprised by one single hull, carrying a main deck and arranged for use in marine petroleum activity with treatment and storage of petroleum fluids both on the field and accosted under land.

More specifically, the application is on a large monohull vessel being applied for several different processes, e.g. a so-called "FPSO"; a floating production, storage and off loading vessel, also performing processing of petroleum fluids, or a conversion plant especially for conversion of petroleum fluids to other, preferably fluid petroleum products, and not necessarily chemical processes but also physical processes, e.g. cooling to LNG. The vessel is arranged for use both connected to the oil producing field via pipelines connected at a rotating turret in the vessel. The vessel also has a plane transom stern, thus it may lie with its stern to the quay.

In this way dead time is avoided during well work over and halted petroleum production, in that the vessel may be moved to other wells or along the quay where it may work with petroleum fluids delivered from gas storage tanks onshore. At the same time the vessel will be arranged with large storage tanks 11 for petroleum fluids in order to have a buffer capacity both if it in periods must receive more petroleum fluid than what can be processed, or if there are discontinuities in the reception petroleum fluid to be processed. The tanks 11 may be arranged with bulkheads and baffle plates and a design of the free surfaces in order to work out of phase with the vessel's rolling and pitching.

Under stationary operation at sea, especially with a vessel performing continuous work in rough sea, the vessel will experience rolling, pitching and heave movements due to the waves. The rolling, pitching and heave movements will normally have each their dominating or natural frequency. Swell will also lead to slow rolling and heave even in calm sea. Periodic rotation movements as rolling and pitching are generally disadvantageous in that pressure, flow and forces

in all processes on board vary due to the more or less periodic accelerations and rotations. It is also disadvantageous to the crew and their work operation that the vessel rolls and pitches. If these vessel movements are reduced in amplitude and frequency, the work on board may generally be done better and more efficiently. Further the wave movements from the vessel will propagate further to pipelines connecting the vessel with wells on the seabed, and to anchoring devices. It is desirable to reduce these vessel movements to a large extent. By reducing the vessel movements for such a vessel the tolerance of the vessel for bad weather is extended, so that operations which under the known art must be interrupted due to the weather, may be restarted earlier on dropping wind, and to be interrupted later on increasing wind. A vessel according to the present invention will thus have a longer proportion of operation time at harsh weather conditions. An additional moment of the invention is that by reduced roll- pitch and heave movements the load due to vertical acceleration and bending of risers, coiled tubing, and load on drilling fluid pumps, moorings and other equipment, is reduced to a lower level than by using vessels according to known art.

Such problems with roll, pitch and heave moments and other wave movements may be counteracted by using the present invention comprising a vessel, preferably for petroleum processing and storage, which carrying capacity primarily is comprised by one single hull, with a main deck, and where the new and inventive trait is comprised by one, essentially horizontal dampening device reaching out on either side of the hull, under the water line, extending preferably along the entire length of the hull.

Further inventive traits by the vessel is to be found in the subordinate claims.

A vessel according to the invention will for this purpose be very large and is arranged to carry a production plant and a processing or conversion plant for petroleum fluids, i.e. gasses and liquids. Several of these processes depend on stabile and relatively predictable pressure conditions. In addition to the fact that the vessel will have reduced roll and heave, parts of the vessel's after end

according to the invention will have an area of reduced heave, partly at the cost of a little increase of heave for the bow because the dampening device in the preferred embodiment of the vessel increases in width sternwards along the ship's side, and in addition cooperates with a second dampening device at the stern. However, the size of the vessel will do that the weakly increased heave motion of the vessel will not give a considerable disadvantage. Also there will not be performed any processing activity in the bow area because the vessel according to a preferred embodiment will have its crew section in the bow towards the weather due to small amounts of gas which can leak from such a large processing device.

Another purpose with the vessel is that it shall be able to store petroleum fluids immediately after production from wells on the seabed and deliver and load petroleum fluids, either directly, or in processed form further to shuttle tankers which can tie up to transfer lines astern on this vessel. The width of the vessel's stern will then function as a breakwave where shuttle tankers may be situated completely or partly leeward of the vessel because the vessel in a preferred embodiment is designed to be turned with the bow towards the present weather, i.e. the combination of waves and wind.

The invention will below be described with reference to figure drawings, where:

Fig. 1 describes schematically a horizontal plane view and section of the entire hull with a dampening devices according to the invention,

Figs. 2 and 2b describe schematically a vertical right-to-left section at A-A', about astern of midship of the vessel,

Fig. 3 describes schematically a vertical athwartships section by B-B' a little afore of the transom stern.

Fig. 4 displace a plane section of the main deck with the vessel situated with the stern alongside the quay.

Fig. 5 shows a long section along the vessel and the front of the quay with the vessel lying

ballasted down to a fundament on the seabed.

Fig. 6 shows a sketch of a situation with a vessel according to the invention stationary in the open sea over a petroleum fluid producing well.

Fig. 1 describes a schematic plane view and section of the vessel according to the invention with a waterline section of a hull 3, and the plane view showing dampening devices 2 arranged below the waterline. The hull 3 has in a preferred embodiment even width, but may in alternative embodiments have other development of the width from the bow to the stern. The vessel has, afore of the midship, a rotating turret 14. The vessel's stern 32 is primarily plane and vertical, with a concave cavity 34 in the lower part of the transom stern 32 with the lower side of the cavity comprised by a dampening device 2'. By the vessels stern the hull's cross section is extended by projections for extending generally in the entire height of the vessel from the bottom plate 40 and up to the main deck 1. The purpose with these projections 40 is to increase the vessel's directional stability so that it will direct itself towards the weather when it is moored at sea by means of mooring devices 400, via the rotating turret 14, e.g. when the vessel via and production risers 200 is situated connected to a well at the seabed with petroleum fluids.

Fig. 2 and Fig. 3 show vertical cross sections of the vessel, with the wings or dampening devices 2 in the preferred embodiment arranged in level with the essentially plane bottom plate 40 of the vessel. In the hull's 3 stern there is a concave cavity 34, with bottom of the cavity comprised by a second dampening device 2', which in a preferred embodiment generally is arranged in level with bottom plane 40 of the vessel. Due to that the dampening devices 2 and 2' are in level with and do not reach deeper than the vessel's bottom plane 40 the possibility exist to ballast the vessel and to set it down on a foundation along the quay. Because the dampening devices 2 and 2' are preferably plate shaped and horizontal, they counteract both rolling, pitching and heave, contrary to if they should have been arranged vertically, a situation where they would not

be able to counteract pitching and heave to a considerable degree. The vessel's hull 3 and dampening device 2 and 2' may be designed in steel, but it is in a preferred embodiment also possible to build considerable parts of the vessel in armed concrete. For vessels for the purposes as described above, it is desirable to have a deck area which is as large as possible and plane o the main deck 1. The vessel has a large width of the main deck 1. In a preferred embodiment the main deck has an even width generally from bow area and the entire length back to the main deck's 1 end entirely at the stern of the vessel. This also reduce the risk that a wave coming in from the front and being higher than the freeboard to break in over the main deck 1 astern. The vessel's hull has a considerably narrower width of the hull 3 in the waterline than the main deck. This contributes to dampen the effect of vertical movements of the sea so that the vessel does not heave as much as it would have done with a larger area inside the waterline.

The purpose with and the effect of the dampening devices 2 and 2' is to dampen the vessels roll- and pitching movements by dispersing the wave forces and the water flow around the hull 3, but will also contribute to a certain dampening of heave (vertical movement). As mentioned above there will arise a "zero point area" for the vertical movement somewhere centrally on the stern part of the main deck 1, at the price of a certain increased vertical acceleration in the bow part. In this area with reduced vertical accelerations the processing or conversion equipments demanding the most stabile fluid conditions may be arranged.

Fig. 2 shows a schematic view and vertical cross section through the vessel, with the dampening devices 2 shown in section. One or more vertical openings 22 in the dampening device 2 are arranged for permitting a limited vertical flow-through of water and thereby give a dampening of the waves effect on the vessel, and at the same time to disperse the energy of the waves. In addition the vessels rotation moment of inertia around the vessels main axis is increased due to two reasons:

1: A large mass is added represented by the dampening

devices 2 situated thwartships of the vessels main axis and with a large separation from the main axis.

2: A certain water mass is bound over each of the dampening devices 2, which are forced to partly follow the vessel's rotation movement when the dampening device 2 is on its way alternately at the starboard and the port side when the vessel rolls.

In addition to that vessel's rolling movements are dampened in amplitude and frequency due to that the rotation moment of inertia of the vessel increases, the rolling movements will be hampered by the dampening devices friction against the water masses due to the water's viscosity when the water is to be forced outside the dampening devices alter edge and through the openings 22.

A standing rim 24 on the dampening device 2 will contribute to reduce the overlying water masses (in relation to the dampening devices 22) possibility to flow sidewards, so that these water masses to a larger degree of forced with the rolling movement of the vessel.

Additional dampening of the vessel's rolling may be achieved by arranging air filled tanks 26, shown in Fig. 2b, with opening only down toward the water, at either side of the vessel. The tanks 26 may have an alter wall 26'. Such stabilizing tanks 26 may be designed in under and in cooperation with the overhanging main deck 1 of the vessel out over the hull 3 outer side, and also to stiffen up the dampening devices 2 by means of vertical plates 26" standing between the hull 3 or main deck 1 and dampening devices 2.

In an alternative embodiment it is possible to let stabilizing tanks 26 outer wall 26' extend entirely or in partial connection with the standing rim 24. When the vessel rolls the water surface will press up the air pressure or suction down the air pressure in the air column which is locked above the water surface and below the top of the tanks 26, which may be comprised by the hull's 3 upper projection or the underside of the main deck 1.

Clearly the vessel must be designed so large that the vessel's width is made preferably larger than the pronounced wave length which one wishes to avoid rolling with. Such a vessel with such a dampening device 2 will namely be forced

to roll in phase with waves of a certain wavelength range in the order of the vessel's width.

It is also possible to design the dampening devices 2' astern edge 21' towards the sea so that it extends like a generally convex ark 21' out from the vessel's stern 32, arranged for rejecting vessels which would come too close to the stern 32.

In alternative embodiments, dampening device 2 and 2' may consist of a frame with a lattice with several horizontally arranged lying plates with mutual separation or a grating of similar shape.

In a preferred embodiment the vessel is not designed to have its own propulsion engines but is designed to have propulsion by means of tender vessels. It will need tender vessels during transit. In a preferred embodiment the vessel has power devices 8 for emergency propulsion and dynamic positioning. The hull 3 is hydrodynamically designed to be able to lay with the bow 33 towards the weather. Such power devices may be so-called "azimuth thrusters" with horizontal propeller axle arranged on a rotatable vertical stem comprising a vertical axle and gears, having the propeller power working freely rotatable through 360° all around the horizon. These power devices are in a preferred embodiment arranged astern at the starboard and port side of the hull 3 extending out through the bottom plane 40 under the projections 4. The projections 4 will give the vessel good directional stability with respect to the direction of the dominating weather, and reduce the need for machine power to lie in a good position towards the weather.

Fig. 4 shows a schematic plane view of the vessel situated by the quay. The dampening device 2 has in a preferred embodiment several vertical openings 22 arranged to allow a limited vertical water through flow and thus imposes dampening of the waves' effect on the vessel. These openings are designed according to actual wave- and current conditions for ordinary operation. The dampening device 2 (2') with the openings 22 (22') will thus counteract and partially delay the flow-through of water and thus work as a fluid mechanical filter, especially on the vessel's sidewards rolling, and also vertical movement or heave, and

also pitching. The effect of the filter is mathematically to reduce the high frequent amplitudes of the vessel's rolling and heave.

An important prerequisite of the invention is that the vessel shall comprise a transom stern 32 arranged to lie along a quay, shown in Fig. 5. Devices 340 are arranged for transport of materials in solid and fluid form, and energy, mainly between the vessel's stern and the onshore when the vessel is situated by the quay. The vessel may in this position under land receive gas from storage tanks or gas pipelines onshore, convert the gas to fluid petroleum products, e.g. diesel oil, which it exports onshore in to the quay afterwards. Fig. 5 shows further that the vessel may be arranged to lie on foundations at the seabed. An alternative solution is to moor the vessel in the ordinary way with bow moorings out into the sea and stern or quarter fast towards the quay.

When the vessel is moored on the field, it may be moored by means of mooring devices 400, e.g. with anchor lines between the rotating turret 14 and suction anchors in the seabed, and such that the vessel receives petroleum fluids from wells on the seabed via risers 200. Together with the risers 200 there may also be arranged signal- and energy carriers for well control. Such a situation may be illustrated by Fig. 6, showing how the vessel may lie on the weather and convert gas which is being received through the pipelines 200. The gas is converted by means of a gas conversion plant 220 to other petroleum fluids.

One may think of other purposes for the vessel than using it for gas converting and storage ship on an oil field. However, other applications in an oil field will not be significantly different from the present invention.

The bottom 40 of the vessel is in the invention not bound to be plane or horizontal and the dampening devices 2 are not either limited to lie level with the bottom or to have entirely plane shape or to lie entirely horizontal.

# C l a i m s

1. Vessel, preferably for petroleum processing and storage, with carrying capacity essentially comprised by one single hull (3), with a main deck (1),
c h a r a c t e r i z e d b y
at least one, essentially horizontally shaped dampening device (2) reaching out on either side of the hull (3), situated below the water line, and with an extension preferably along the entire length of the vessel.

2. Vessel according to claim 1,
c h a r a c t e r i z e d b y one or more vertical openings (22) in the dampening device (2) arranged to allow a limited, mainly vertical flow of water through the dampening device (2), and thus lead to additional dampening of the vessel's movements, mainly roll, pitch and heave movements.

3. Vessel according to claim 1,
c h a r a c t e r i z e d i n that the dampening device (2) being mainly plate-shaped, preferably with its lower side in level with the vessel's plane outer bottom surface (40).

4. Vessel according to claim 1,
c h a r a c t e r i z e d b y a progressively increased separation between the outer edge (21) of the dampening device (2) and the vessel's centre line, from the area near the bow (33) to essentially the area near the vessel's stern (32).

5. Vessel according to claim 1,
c h a r a c t e r i z e d b y at least one standing rim (24), mainly along the dampening device's (2) outer edge (21), with the rim (24) arranged to limit the freedom of horizontal flow of the water masses within the rim in the thwartships direction, and to bind the water masses to contribute to the vessel's rolling moment of inertia.

6. Vessel according to claim 1,
c h a r a c t e r i z e d b y hull wings (4) on either side of the stern of the hull (3) defined as a progressive sidewards projection rearwards of the hull's (3) cross-section width in the sternmost part of the hull, comprising essentially between a distance less than the sternmost quarter part of the hull (3) and the transom stern (32), such that the cross-section width of the hull is increased essentially along all the depth of the vessel.

7. Vessel according to claim 1,
c h a r a c t e r i z e d b y an essentially horizontally extending dampening device (2') below the waterline of the hull's (3) stern (32).

8. Vessel according to claim 7,
c h a r a c t e r i z e d i n that the dampening device (2') is generally plate-shaped, preferably with its lower side in level with the vessel's plane outer bottom surface (40), and constituting the bottom in a concave vault or niche opening (34) in about the lower half of the vessels' transom stern (32), and situated essentially between the projections (4).

9. Vessel according to claim 7 or 8,
c h a r a c t e r i z e d i n that the dampening device's (2') rear edge (21') towards the sea extends parallel with, and is arranged essentially directly below the main deck's (1) sternwards end, and being in the plane of the vessel's transom stern (32).

10. Vessel according to claim 7 or 8,
c h a r a c t e r i z e d i n that the dampening device's sternwards edge (21') towards the sea extends as a mainly convex arc (21') out from the stern (32), arranged to reject vessels which would come to close to the stern (32).

11. Vessel according to claim 1,
c h a r a c t e r i z e d b y at least one or more storage tanks (11) under the main deck (1) of the hull (3).

12. Vessel according to one of the above claims, c h a r a c t e r i z e d b y a rotating turret (14) extending through the bottom surface (40) by the vessel's centre line and being forward of the midship in the vessel's hull (3), possibly also extending through the main deck (1), and essentially arranged for rotatable vertical connection to take up anchoring forces via anchoring devices (400) and for connection for production risers and transfer cables (200).

13. Vessel according to claim 1, c h a r a c t e r i z e d i n that the vessel's stern, essentially the main deck's (1) sternwards end and the transom stern (32) is arranged to lie towards a quay.

14. Vessel according to claim 13, c h a r a c t e r i z e d i n that the vessel is arranged for mooring freely floating at sea.

15. Vessel according to claim 13 or 14, c h a r a c t e r i z e d i n that the vessel is arranged for, by ballasting or loading, to be lowered to rest on a foundation.

16. Vessel according to claim 1 or 12, c h a r a c t e r i z e d i n that the hull is hydrodynamically shaped to be able to be lying stationary by means of anchoring devices (400), preferably connected to the turret (14), and preferably with the bow towards the weather.

17. Vessel according to claim 1 or 16, c h a r a c t e r i z e d i n that the vessel's stern, mainly the main deck's (1) sternwards end and the transom stern (32) is arranged to form a relatively shielding quay or breakwave for other vessels mainly coming in from the leeward side.

18. Vessel according to one of the claims 13-17, c h a r a c t e r i z e d b y devices (340) arranged for

transport of material, in the form of solids and fluids, and energy, essentially between the main deck's (1) stern end, and onshore.

19. Vessel according to claim 1, c h a r a c t e r i z e d b y power devices (8) for positioning and dynamic direction control in order to make the vessel lying in a preferred azimuthal direction.

20. Vessel according to claim 19, c h a r a c t e r i z e d i n that the power devices (8) comprise thrusters.

21. Vessel according to claim 1, c h a r a c t e r i z e d b y even width of the main deck (1) from behind the area of the bow, and sternwards to the stern (32) of the hull (3).

22. Vessel according to claim 1, c h a r a c t e r i z e d b y progressively increasing width of the main deck (1), from behind the area in the bow, and sternwards to the stern (32) of the hull (3).

23. Vessel according to claim 1, c h a r a c t e r i z e d b y a processing plant or a conversion plant (220) arranged on the vessel's deck.

24. Vessel according to claim 1, c h a r a c t e r i z e d b y stabilizing tanks (26), with submerged opening in the water, and arranged on either side of the vessel, arranged for an air-filled upper part and submerged opening, for roll dampening effect.

## AMENDED CLAIMS

[received by the International Bureau on 25 May 1999 (25.05.99);
original claims 11-24 cancelled; original claims 1-10 amended; (2 pages)]

1. Vessel, preferably for petroleum processing and storage, with carrying capacity essentially comprised by one single hull (3), with a main deck (1),
c h a r a c t e r i z e d b y
at least one, essentially horizontal plate-shaped dampening device (2) reaching out on either side of the hull (3), and situated below the water line, and extending preferably along the entire length of the vessel.

2. Vessel according to claim 1,
c h a r a c t e r i z e d b y one or more vertical openings (22) in the dampening device (2) arranged to allow a limited, mainly vertical flow of water through the dampening device (2), and thus entailing additional dampening of the vessel's movements, mainly roll, pitch and heave movements.

3. Vessel according to claim 1,
c h a r a c t e r i z e d b y the dampening device (2) being arranged with its lower side in level with the vessel's plane outer bottom surface (40).

4. Vessel according to claim 1,
c h a r a c t e r i z e d b y a progressively increased separation between the outer edge (21) of the dampening device (2) and the vessel's centre line, from the area near the bow (33) to essentially the area near the vessel's stern (32).

5. Vessel according to claim 1,
c h a r a c t e r i z e d b y at least one standing rim (24), mainly along the dampening device's (2) outer edge (21), with the rim (24) arranged to limit the freedom of horizontal flow of the water masses within the rim in the thwartships direction, and to bind the water masses to contribute to the vessel's rolling moment of inertia.

6. Vessel according to claim 1, c h a r a c t e r i z e d b y projections or hull wings (4) on either side of the stern of the hull (3) defined as a progressive sidewards increase rearwards of the hull's (3) cross-section width in the sternmost part of the hull, comprising essentially between the distance less than the sternmost quarter part of the hull (3) and the transom stern (32), such that the cross-section width of the hull is increased essentially along all the depth of the vessel.

7. Vessel according to claim 1, c h a r a c t e r i z e d b y an essentially horizontally extending dampening device (2') below the waterline of the hull's (3) stern (32).

8. Vessel according to claim 7, c h a r a c t e r i z e d i n that the dampening device (2') is generally plate-shaped, preferably with its lower side in level with the vessel's plane outer bottom surface (40), and constituting the bottom of a concave vault or niche opening (34) in about the lower half of the vessels' transom stern (32), and situated essentially between the projections (4).

9. Vessel according to claim 7 or 8, c h a r a c t e r i z e d i n that the dampening device's (2') rear edge (21') towards the sea extends parallel with, and is arranged essentially directly below the main deck's (1) sternwards end, and being in the plane of the vessel's transom stern (32).

10. Vessel according to claim 7 or 8, c h a r a c t e r i z e d i n that the dampening device's sternwards edge (21') towards the sea extends as a mainly convex arc (21') out from the stern (32), arranged to reject vessels which would come to close to the stern (32).

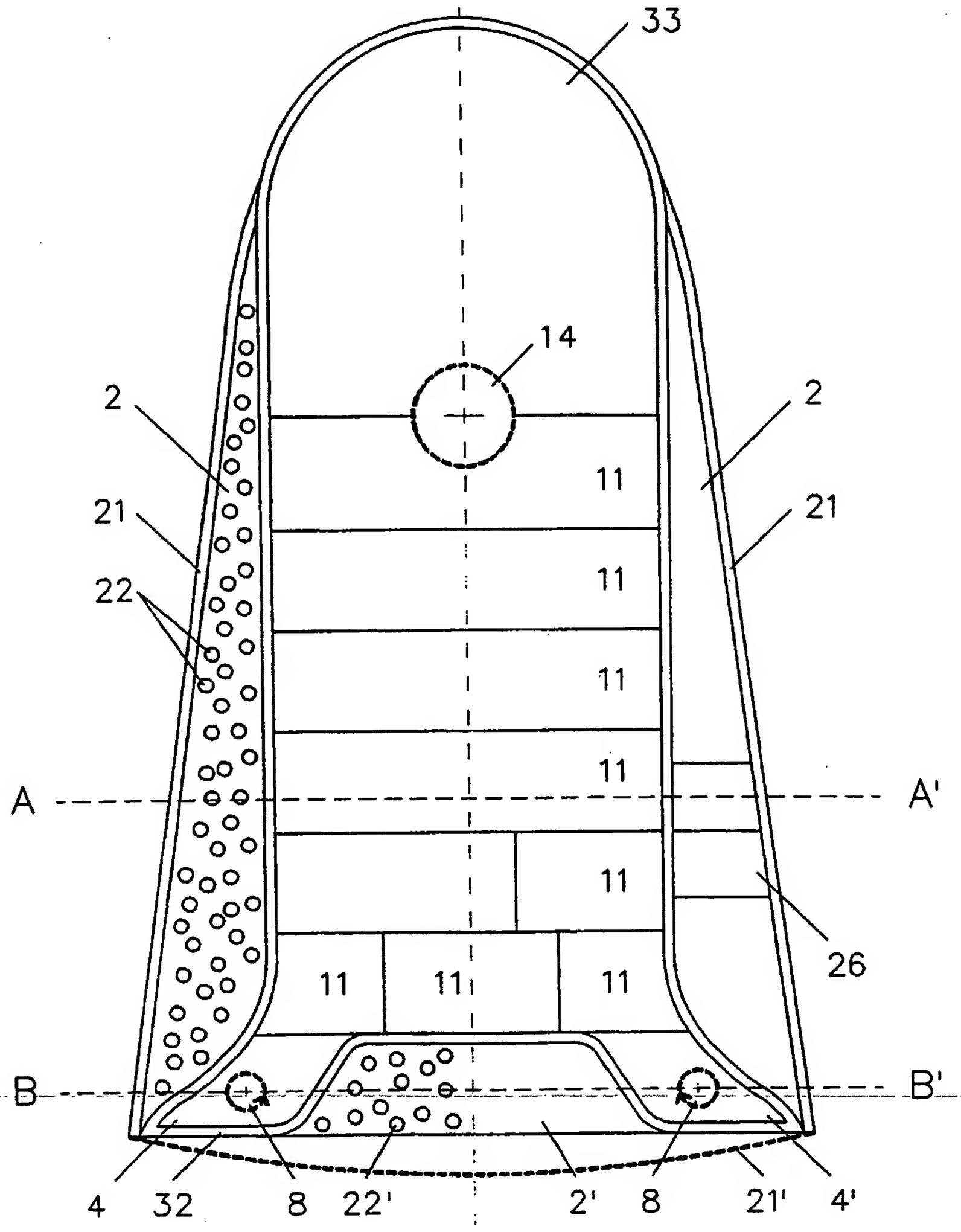


FIG. 1

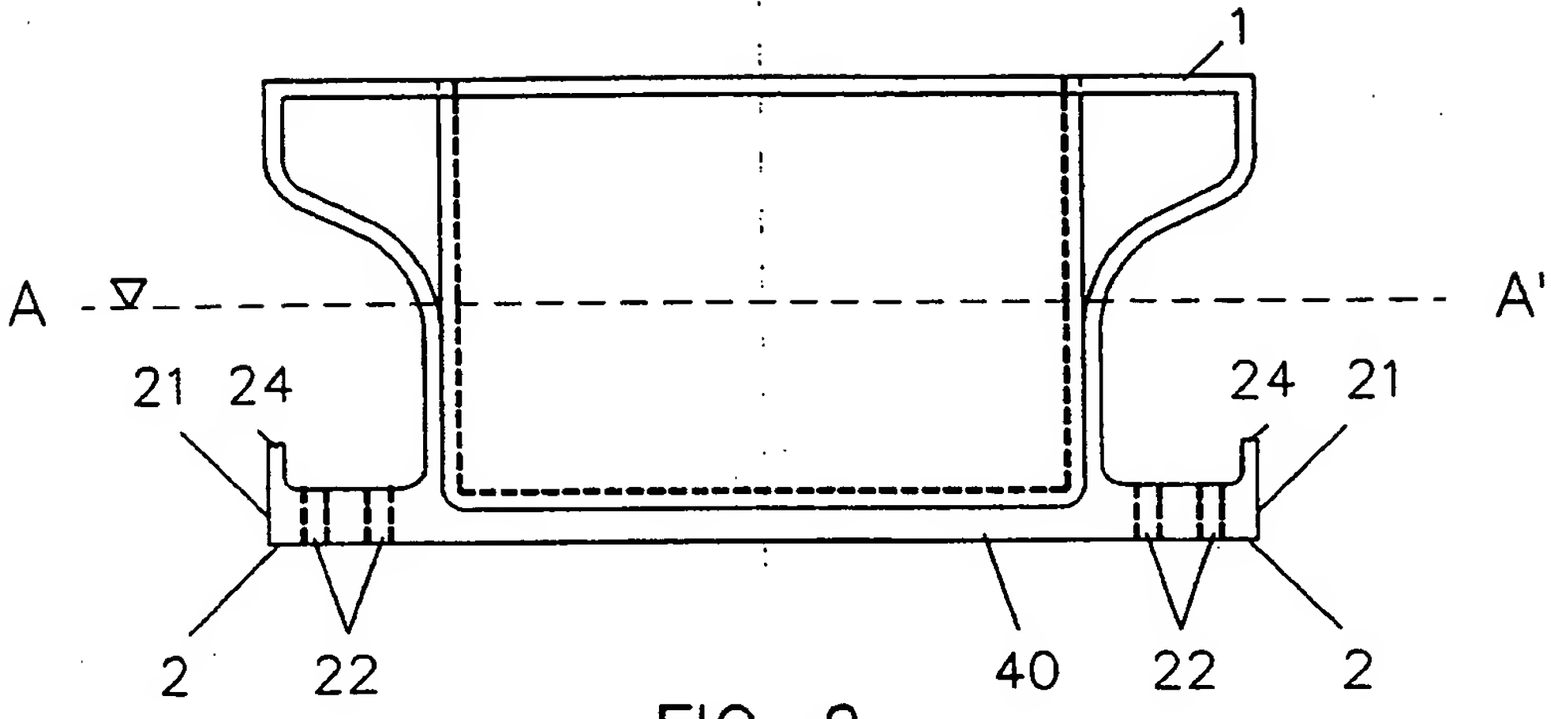


FIG. 2

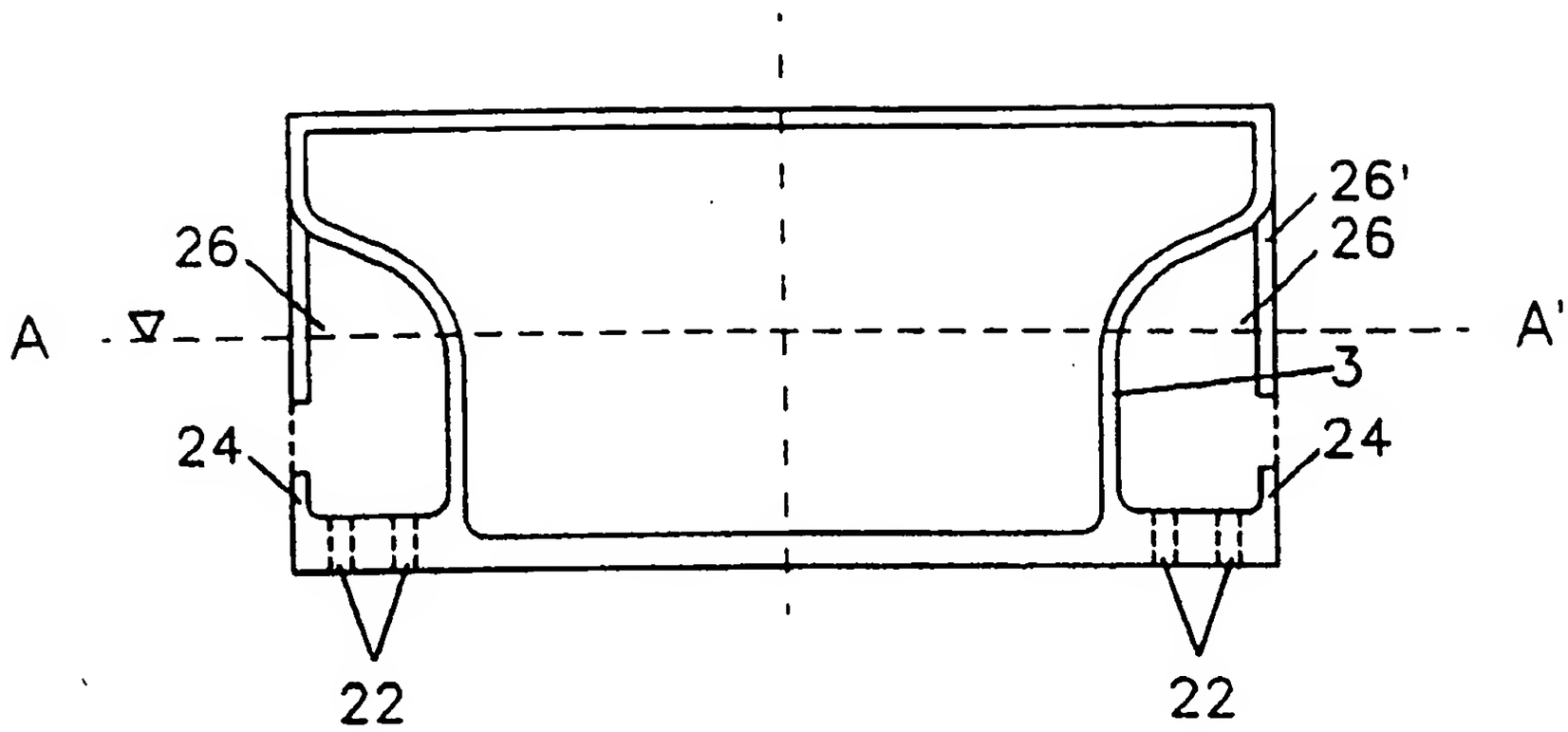


FIG. 2b

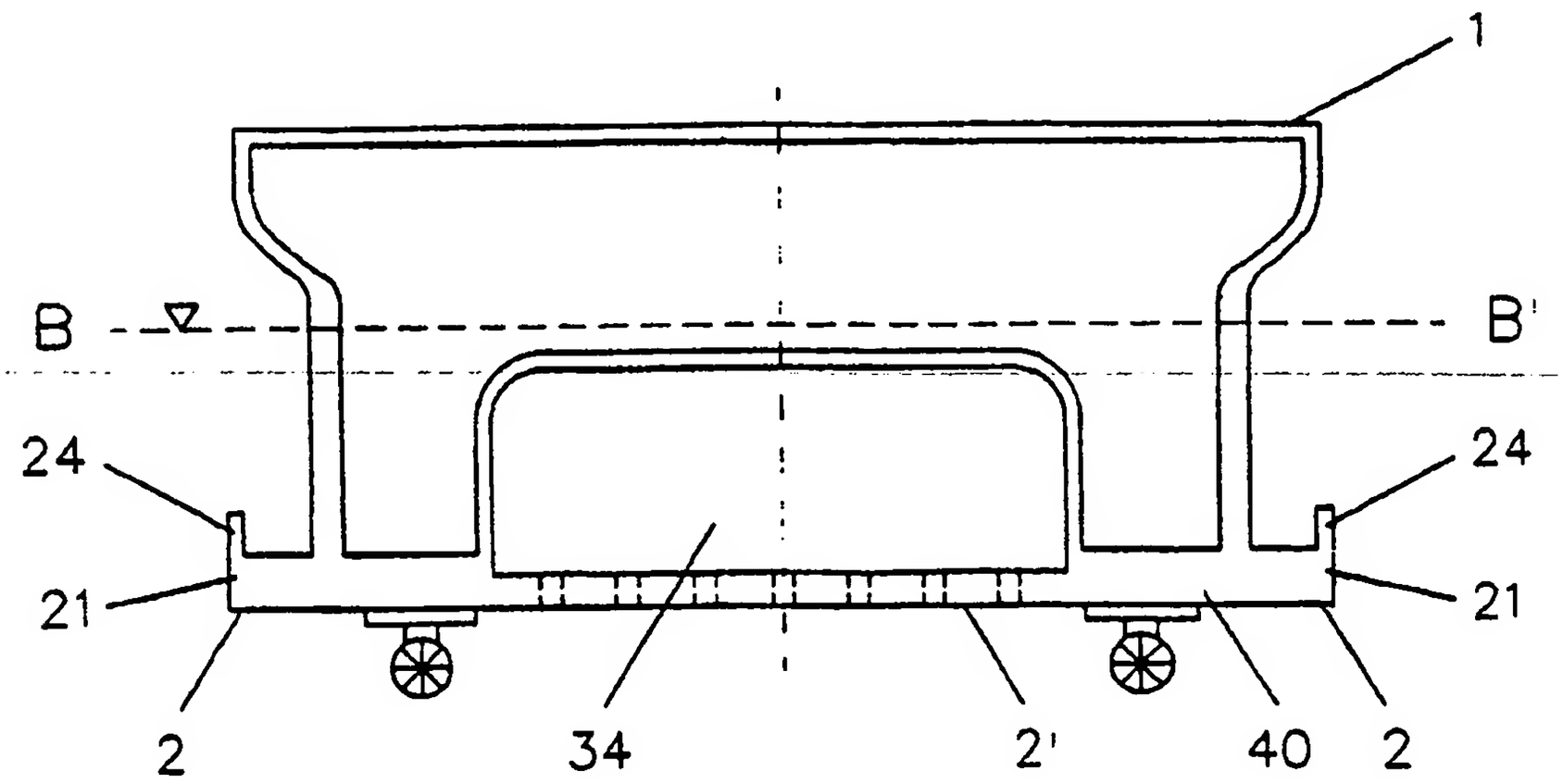


FIG. 3

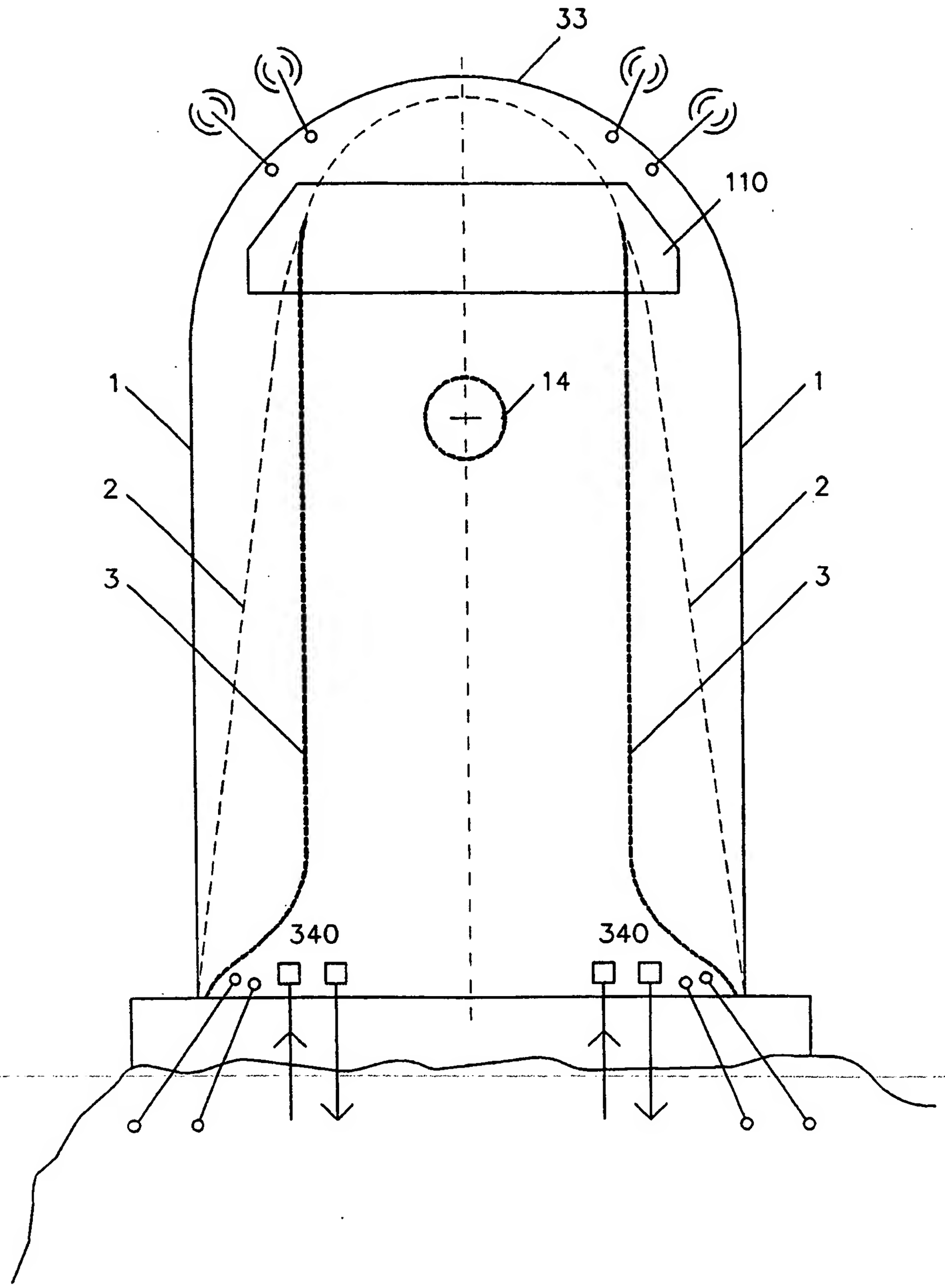


FIG. 4

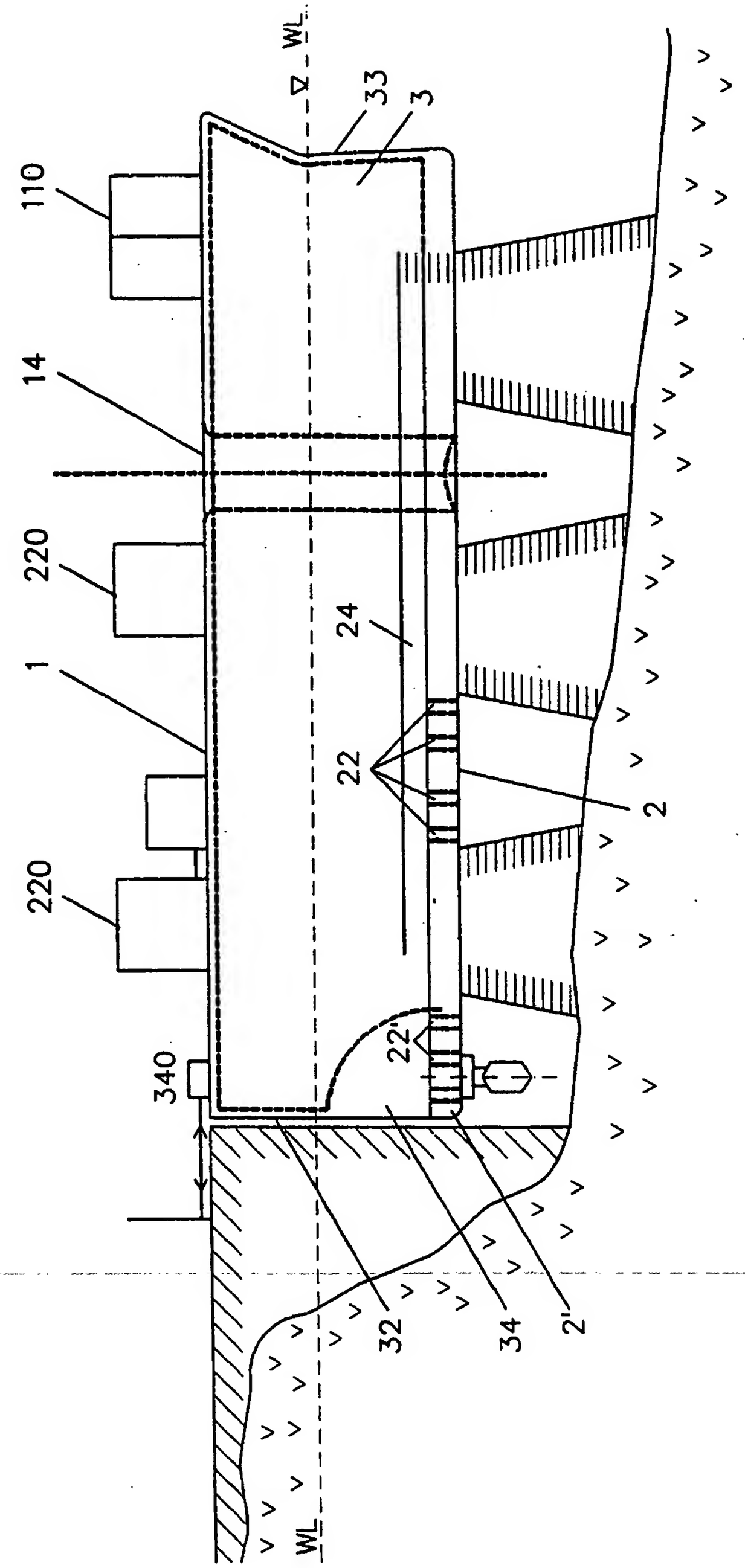


FIG. 5

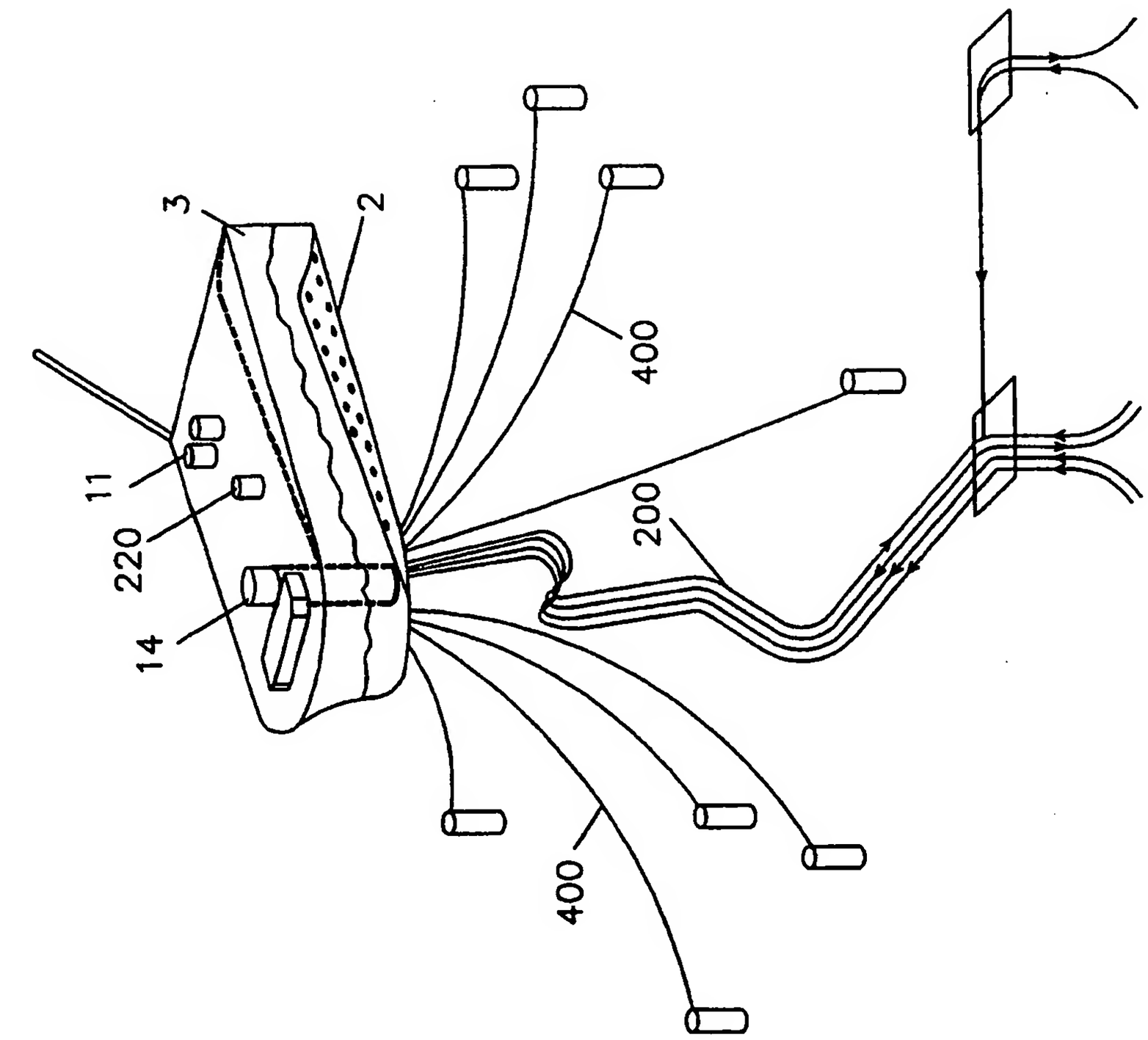


FIG. 6

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 98/00375

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B63B 39/06
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EDOC WPIL

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | GB 1519979 A (NETHERLANDS OFFSHORE COMPANY), 2 August 1978 (02.08.78), page 1, line 10 - line 16; page 2, line 57 - line 67, figures 1,2,5-7 | 1,2,3,24 |
| A | US 3797440 A (PANGALILA), 19 March 1974 (19.03.74) | 1-10,24 |
| A | DE 1001146 A (LEO COSTA, VIGO ET AL), 17 January 1957 (17.01.57) | 1-10 |

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 12 May 1999 | 18 -05- 1999 |
| Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86 | Authorized officer Christer Jönsson Telephone No. + 46 8 782 25 00 |

Form PCT/ISA/210 (second sheet) (July 1992)

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO98/00375

**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-10,24

Remark on Protest
☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/NO98/00375

A first invention (claims 1-10, 24) comprising means to decrease unwanted vessel movements.

A second invention (claim 11) comprising storing tanks located inside the vessel.

A third invention (claims 12,14, 16, 17) comprising a turret means.

A forth invention (claims 13, 15, 18) comprising a special shape of the hull.

A fifth invention (claims 19, 20) comprising dynamic anchoring means.

A sixth invention (claims 21, 22) comprising the shape of the deck.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

07/04/99

International application No.
PCT/NO 98/00375

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| GB 1519979 A | 02/08/78 | AU 501832 B | 28/06/79 |
| | | AU 1943976 A | 18/05/78 |
| | | DE 2649371 A,B,C | 18/05/77 |
| | | GR 61762 A | 09/01/79 |
| | | IE 43971 B | 15/07/81 |
| | | JP 52079498 A | 04/07/77 |
| | | NL 161105 B,C | 15/08/79 |
| | | NL 7514154 A | 27/02/76 |
| | | US 4100873 A | 18/07/78 |
| US 3797440 A | 19/03/74 | NONE | |
| DE 1001146 A | 17/01/57 | NONE | |